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SECURITY INFORMATION

PROVISIONAL INTELLIGENCE REPORT

PETROLEUM IN THE SOVIET BLOC

PETROLEUM PRODUCTS IN THE SOVIET BLOC

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FOREWORD

This report is one of a series of provisional reports pertaining to petroleum in the Soviet Bloc. The entire series is intended to cover all phases of petroleum, natural gas, and synthetic liquid fuels in the Soviet Bloc. These reports are presented as an intermediate step in consolidating pertinent intelligence on the subject and not as a finished study. In the consolidation of the available information, various reports and documents representing research by other intelligence agencies were utilized along with the results of research and analysis by members of the staff of CIA.

It is intended that this series of reports will serve the following purposes:

a. Represent a base for contributions and additions by CIA and other agencies actively interested in petroleum intelligence.

b. Facilitate the selection of the specific and detailed gaps in intelligence warranting priority attention.

c. Provide the basis for a broad study on petroleum in the Soviet Bloc and various studies directed toward specific critical problems.

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PETROLEUM PRODUCTS IN THE SOVIET BLOC

IV-A

Summary

The estimated gross availability of petroleum products of all kinds in the Soviet Bloc for calendar 1950 and 1951, and for fiscal 1953, is shown below in Table 1. As used herein, gross availability means the availability of all types of non-gaseous petroleum products from indigenous crude oil production, or indigenous synthetic and shale oil production, in each component area of the Bloc, without taking into account the trade balances of the components of the Bloc in crude or products, and without making deductions for the consumption of petroleum by the petroleum industry itself.

Table 1

Estimated Gross Availability of Petroleum Products in the Soviet Bloc

1950, 1951, Fiscal 1953

Million Metric Tons

	1950	1951	Fiscal 1953
USSR			
Products from Indigenous natural crude oil	32.2	35.2	38.9
Products from Indigenous Synthetics and Shale oil	.7	1.3	2.3
Sub-total, USSR	32.9	36.5	41.2
SATELLITES			
Products from Indigenous natural crude oil	6.4	8.3	9.5
Products from Indigenous synthetics and Shale oil	1.2	1.4	1.7
Sub-total, Satellites	7.6	9.7	11.2
Total Gross Availability in the Soviet Bloc	40.5	46.2	52.4

Table 1, above, deals only in terms of total products. Table 2, Appendix, provides a more detailed presentation and separates petroleum products into residuals and distillates.

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1. USSR.

a. Availability of Petroleum Products from Indigenous Natural Crude Oil.

Very little direct intelligence is obtainable for the USSR during the period under consideration on the availabilities of products from natural crude oils for consumption or storage. It is therefore the object of this report to estimate the availability of petroleum products, based on estimates of the production and refining of crude oil in the USSR. One of the principal problems which arises in this connection is the proper calculation of the losses which occur in various stages of the production, refining, storage, and transportation of crude and products. Table 3, Appendix , details the best estimate of the gross availability of natural petroleum products in the USSR which it has been possible to make on the basis of estimates contained in the individual papers which make up this project, and on the basis of such evidence as is now available on the losses of crude and products being experienced by the Soviet petroleum industry.

The difficulties involved in this method of estimate are numerous. The first of these difficulties is that Soviet sources do not make it clear, when referring to crude production, whether the values given refer to crude production at the well head, or at some other point. It is not often made clear whether the crude productions cited refer to crude oil before or after settling, gas-separation, or treatment. The indigenous Soviet crude production values shown in Table 3 are taken from I-A., Availability of Crude Petroleum in the USSR. These values are estimates of the production of clean crude oil, free of gas, bottom settlings, and water, measured at the first point in the producing field where the crude would meet these

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specifications. While this point would not actually be the well-head, for purposes of simplification this estimate of production will be termed "well-head" production.

In any crude producing operation, certain losses may be anticipated between the time the crude leaves the well-head, as defined above, and the time when the crude reaches the refinery. It may be possible to establish "normal" losses in this regard by an examination of US practice, which may be considered close to the optimum in efficiency. The problem of determining "normal" losses in the US petroleum industry is complicated by the fact that published petroleum statistics do not record well-head production as such. It is therefore difficult to completely document losses between the well-head and the refinery. Based on practice in the US for determining the volumes of oil subject to royalty agreements, it appears that a 1/2% loss of the clean crude oil at the well-head may be anticipated before the crude oil reaches lease-storage, or is delivered to the pipeline. A further 1% transportation loss seems to be normal in US practice before the crude oil reaches the refinery. In addition, in the US, a quantity of whole crude equivalent of 0.8% by weight of the clean crude oil at the well-head appears to be consumed in producing operations (drilling, production, and handling). In short, it would seem that in US practice, about 2% by weight of the clean crude oil produced at the well-head does not reach the refinery.

In the USSR, it is known that similar losses occur. In the 1951 Plan, only 94.2% by weight of the crude oil indicated as being produced is shown as reaching the refinery. However, the disposition of the 5.8 weight percent of crude production

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which did not reach the refinery is not indicated, this amount of crude oil could have been projected as whole crude burned in the field or elsewhere, as oil losses of all types in production, transportation, or storage, or as a net addition to crude oil stocks. The 1941 Plan, therefore, does not identify losses in the Soviet petroleum industry either quantitatively or qualitatively.

Russian technical literature contains numerous references to crude oil losses. However, most of these references are not sufficiently clear to be able to separate "normal" losses (in terms of US practice) from unnecessary losses. The impression which emerges from a study of this literature is that in the USSR, crude losses have historically been higher than in US practice. The impression is also gained that these losses have been the object of a concentrated effort towards their reduction. It may be supposed, therefore, that the current levels of these losses approach US practice, with some allowance for additional losses being made for the inferior facilities still being used for crude storage in the USSR (open pit storage). Losses have therefore been estimated to be about 4% of the clean crude produced at the well-head, where the corresponding loss in the US would approximate 1.5%.

In addition to these losses, it is known that in the USSR in the past, substantial volumes of crude and topped crude (mazut) have been burned both in the producing fields and elsewhere. In 1936, for example, it is known that whole crude oil burned under boilers amounted to 1.6 million metric tons, or almost 6% of the crude produced in that year. 1/* This wasteful practice has been object of much self-criticism in the Soviet petroleum press. It is assumed, therefore, that the burning of whole crude under oilfield boilers will have been reduced to 1% by weight of the clean crude oil produced at the well-head in the period under

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review. It should be noted that this crude oil is not "lost", since it must be considered to be available to meet the fuel needs of the petroleum industry, and may therefore be considered the equivalent of fuel oil. This crude oil cannot, however, be considered as having reached the refinery.

Refinery runs to stills have therefore been calculated as being 95% by weight of the clean crude oil produced at the well-head.

In any refining process, certain normal weight losses may be anticipated in the process of converting crude oil into petroleum products. These losses are the result of the formation of gasses during the refining operation, and of the formation of carbon deposit and other waste. It is estimated in the detailed analysis of the Soviet refining operation presented in I-D, Survey of Probabilities and Potentials in Future Petroleum Refining in the USSR, that the losses which may be anticipated in this respect in the USSR amount to 8% (to the nearest whole weight percent) of refinery runs to stills. In addition, there is substantial evidence that there have been unnecessary losses of crude and products in the Soviet refining process in the past. 1/ 2/ These losses have also been the object of much criticism in the Soviet technical press, and it has therefore been conservatively estimated that extraneous losses in the Soviet refining process now amount to only 1% by weight of the crude run to stills.

Refinery production of natural petroleum products is therefore estimated to be 91% by weight of the crude run to stills for the period under review. It should be noted that this yield is a gross yield; that is to say that no deduction has been made for the fuel oil consumed in the refining process as part of the refinery fuel. It should also be remembered that this estimated yield of refined

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products is dependent on the assumptions made in I-D with regard to the nature of the Soviet refinery construction, and refinery production, programs. While it is not anticipated that any major changes will be made in the data concerning Soviet programs for the years 1950 and 1951, there is some probability that minor changes may be made in the estimated yields of products during fiscal 1953, as a result of research being carried on at the moment.

Before the petroleum product yields so derived can reach the consumer, it is necessary to store, transport, and distribute these products. Characteristically there are losses associated with these operations. In the United States, the volume of these losses is considered to be about 2% by weight of refinery yield of products. 3/ While there is some indication that these losses might be somewhat larger in the USSR, it has been conservatively assumed for purposes of this calculation that distribution losses in the USSR will not exceed those in the United States. A further 2% by weight reduction in the gross availability of petroleum products from natural petroleum has therefore been taken into account.

As a final step in arriving at a true gross availability of natural petroleum products in the USSR, the crude oil which is burned in the field has been added to the gross availability of petroleum products. This takes into account the fact that this crude oil is not a true loss, but rather a consumption of crude in lieu of fuel oil. This crude must therefore be considered to be available for consumption.

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b. Availability of Products from Indigenous Synthetic and Shale Oil Production.

The production of petroleum products from synthetic and shale oil plants in the USSR is the subject of detailed discussion in I-E, Synthetic Oil Industry in the USSR. The estimates presented in Table 4, Appendix, are taken directly from this paper. It will be noted that in calculating the availability of synthetic and shale oil products, the 2% distribution loss discussed above has been taken into account. It is apparent that synthetic and shale oil products will be subject to the same distribution loss, for the same reasons, as are natural petroleum products. This is the only loss which must be taken into account in preparing this estimate, since the estimates of production of synthetic and shale oil products are considered to be ex-refinery (or processing plant). It is not believed that any substantial amounts of these petroleum products are consumed as fuel in the process of manufacturing synthetic / shale oil products.

c. Gross Availability of Petroleum Products from All Soviet Sources.

Table 5, Appendix, presents the gross availability of petroleum products in the USSR. It will be noted that this gross availability refers only to petroleum products manufactured in the USSR, and does not take into account the trade balance of the USSR in petroleum products. There is not available at the moment sufficient intelligence on intra-Bloc movements of petroleum products to be able to determine the exact trade balances of the components of the Bloc.

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2. Satellites.

a. European Satellites.

(1) Availability of Petroleum Products from Indigenous Natural Crude Oil.

In the case of the European Satellites, the estimated availability of petroleum products from natural crude oils has been taken from VI-D, Refinery Production of Petroleum in the European Satellites. It should be noted that the estimates in Table 6, Appendix , represent the gross product potential from indigenous crude in the European Satellites, and not the actual refinery outputs of Satellite refineries.

The gross product potential from indigenous crude has been calculated as being 87% by weight of the crude produced. This calculation takes into account a 1% consumption of crude oil in the field and a 2% loss between the field and the refinery, both calculated on the well-head production of crude oil; an 8% process loss in refining, and a 1% extraneous loss in the refining process, both calculated on refinery runs to stills; and a 2% distribution loss between the refinery and the consumer, calculated on the gross yield of refined products. It will be noted that the crude loss between the producing field and the refinery is somewhat lower than the equivalent loss in the USSR. This is in accord with the available information on losses in the European Satellites, and is probably due to the fact that most Satellite refineries are located close to the producing field, requiring less transportation and handling of the crude oil.

(2) Availability of Petroleum Products from Indigenous Synthetic Production.

Table 6, Appendix , presents the estimated gross availability of petroleum products in the European Satellites discussed in detail in VI-E, Production of

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Synthetic Liquid Fuels in the European Satellites. As in the case of the estimated availability of synthetic fuels in the USSR, these estimates take into account a 2% distribution loss.

(3) Gross Availability of Petroleum Products from All Sources.

The estimates of the gross availability of petroleum products of all types presented in Table 6, Appendix , are derived by adding the estimates discussed above. It should be noted that this gross availability does not take into account the trade balance of the European Satellites in crude or products.

b. Far Eastern Satellites.

Table 6, Appendix, also presents estimates of the availability of petroleum products from natural crude oils, and from synthetic and shale oil production, in the Asiatic Satellites. These estimates are taken from III-A, Petroleum in the Asiatic Satellites. Availabilities of petroleum products from natural crude oils have been calculated on the basis of the losses between the well-head and the consumer which were estimated for the USSR, since there is not available at this moment direct intelligence on current losses in the Far Eastern Satellites. Losses in the distribution of shale and synthetic petroleum products have been considered to be too small, quantitatively, to be taken into consideration. It should once again be noted that the gross availability of petroleum products estimated for the Far Eastern Satellites does not take into account the trade balance of this area in petroleum products.

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APPENDIX

Table 2

Estimated Gross Availability of Distillates and Residuals in the Soviet Bloc

1950, 1951, Fiscal 1953

Million Metric Tons

Year		USSR a/	European Satellites b/	Far Eastern Satellites c/	Soviet Bloc
1950	Products from Indigenous Natural Crude Oil				
	Distillates	18.7	3.8	.1	22.6
	Residuals & Lubricants a/	13.5	2.5		16.0
	Total	32.2	6.3	.1	38.6
	Products from Indigenous Synthetic & Shale Oil Production a/				
	Distillates	.6	1.1		1.7
	Residuals & Lubricants	.1	.1		.2
	Total	.7	1.2		1.9
	Total all Indigenous Products				
	Distillates	19.3	4.9	.1	24.3
	Residuals & Lubricants	13.6	2.6		16.2
	Total	32.9	7.5	.1	40.5
1951	Products from Indigenous Natural Crude Oil				
	Distillates	20.5	4.9	.1	25.5
	Residuals & Lubricants d/	14.7	3.3		18.0
	Total	35.2	8.2	.1	43.5
	Products from Indigenous Synthetic & Shale Oil Production a/				
	Distillates	1.1	1.2	.1	2.4
	Residuals & Lubricants	.2	.1		.3
	Total	1.3	1.3	.1	2.7
	Total All Indigenous Products				
	Distillates	21.6	6.1	.2	27.9
	Residuals & Lubricants	14.9	3.4		18.3
	Total	36.5	9.5	.2	46.2
Fiscal 1953	Products from Indigenous Natural Crude Oil				
	Distillates	22.7	5.6	.1	28.4
	Residuals & Lubricants d/	16.2	3.7	.1	20.0
	Total	38.9	9.3	.2	48.4

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Table 2 (Cont'd)

Products from Indigenous Synthetic & Shale Oil Production e/				
Distillates	2.0	1.5	.1	3.6
Residuals & Lubricants	.3	.1		.4
Total	2.3	1.6	.1	4.0
Total All Indigenous Products				
Distillates	24.7	7.1	.2	32.0
Residuals & Lubricants	16.5	3.8	.1	20.4
Total	41.2	10.9	.3	52.4

a/ Gross Availability of products from natural petroleum calculated from refinery yields given for 1950, I-D, Survey of Probabilities and Potentials in Future Petroleum Refining in the USSR. Production of distillates is calculated to be 54.3% by weight of the crude charge, and yield of residuals and lubricants is calculated to be 37.9% of the charge. Crude charge is considered to be the runs to stills figures given in Table 3, Appendix, less 1% crude loss in refining. The 2% distribution loss is then considered to apply equally to all products. Crude burned in the oilfield is considered to be the equivalent of fuel oil, and is included with residuals. It should be noted that although constant yields have been used for all years, it is probable that Soviet refineries are gradually increasing their yields of distillates, and correspondingly decreasing their yields of residuals.

Gross availability of products from synthetic and shale oil production derived from I-E, Synthetic Oil Industry in the USSR. Yields of distillates are calculated as being 82% in 1950, 84.4% in 1951, and 87.1% in Fiscal 1953. Balance of yield in each period is considered to be residuals. The 2% distribution loss is considered to apply equally to all products.

b/ Gross availability of products from natural petroleum in the European Satellites is calculated from yield data given in II-D, Refinery Production of Petroleum in the European Satellites. Production of distillates is calculated to constitute 60.2% of the production of all products, and the production of residuals to constitute the other 39.8%. The 2% distribution loss is considered to apply equally to all products.

Gross availability of products from synthetic production in the European Satellites derived from II-E, Production of Synthetic Liquid Fuels in the European Satellites. Yields of distillates are considered to approximate 91% of production, and residuals the other 9%. The 2% distribution loss is considered to apply equally to all products.

c/ The gross availability of products from both natural crude oil, and synthetic and shale oil production, in the Far Eastern Satellites is derived from III-A, Petroleum in the Asiatic Satellites. The yield of distillates from the refining of crude oil is calculated to approximate 54.0% of the production of all products, and the production of residuals is calculated to account for the remaining 46.0%. Yields from synthetic and shale oil production are calculated to be 70.0% distillates and 30.0% residuals.

d/ Includes crude oil burned in the oilfield.

e/ Differences in the percentage yields of distillates and residuals from synthetic and shale oil production in various areas of the Bloc are due to differences in the quantities of shale oil production, and to differences in the types of synthetic production (Bergius and Fischer-Tropsch).

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Table 3

Gross Availability of Petroleum Products from Indigenous Natural Crude Oil in the USSR

1950-1953

Million Metric Tons

	1950	1951	1952	Fiscal 1953	1954
Indigenous crude production at the well-head a/	37.5	41.0	44.0	45.4	46.7
Less: 1% crude consumed in the oilfield	.4	.4	.4	.5	.5
4% crude oil loss	1.5	1.6	1.8	1.8	1.8
Refinery runs to stills	35.6	39.0	41.8	43.1	44.4
Less: 8% process loss b/	2.8	3.1	3.4	3.5	3.6
1% extraneous crude loss	.4	.4	.4	.4	.4
Refinery production	32.4	35.5	38.0	39.2	40.4
Less: 2% Distribution loss	.6	.7	.8	.8	.8
Availability of natural petroleum products	31.8	34.8	37.2	38.4	39.6
Plus: 1% crude consumed in the oilfield	.4	.4	.4	.5	.5
Gross availability	32.2	35.2	37.6	38.9	40.1

a/ Cf. I-A, Availability of Crude Petroleum in the USSR.
b/ Cf. I-D, Survey of Probabilities and Potentials in Future Petroleum Refining in the USSR.

Table 4

Gross Availability of Petroleum Products from Indigenous Synthetic and Shale Oil production in the USSR

1950, 1951, Fiscal 1953

Thousand Metric Tons

	1950	1951	Fiscal 1953
Indigenous Synthetic Production a/	300 b/	650	1,325
Indigenous Shale Oil Production a/	450 b/	700	1,000
	750	1,350	2,325
Less: 2% Distribution loss	15	27	47
Gross Availability of Products from Synthetic and Shale Oil	735	1,323	2,278

a/ Cf. I-E, Synthetic Oil Industry in the USSR.
b/ 1950 estimates not taken from I-E, but estimated separately.

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Table 5

Gross Availability of Petroleum Products from all Indigenous Soviet Sources in the USSR

1950-1953

Million Metric Tons

	1950	1951	1952	Fiscal 1953	1953
Availability of Products from Indigenous Natural Petroleum	32.2	35.2	37.6	38.9	40.1
Availability of Products from Indigenous Shale Oil and Synthetics	.7	1.3		2.3	
Total Gross Availability	32.9	36.5		41.2	

Table 6

Gross Availability of Petroleum Products in the Soviet Satellites

1949-Fiscal 1953

Thousand Metric Tons

	1949	1950	1951	1952	Fiscal 1953 d/
European Satellites					
Gross Availability of Products from Indigenous Natural Crude Oil a/	5726	6273	8165	8965	9311
Gross Availability of Products from Indigenous Synthetic Production b/	1024	1215	1357	1514	1600
Sub-total, European Satellites	6750	7488	9522	10479	10911
Asiatic Satellites					
Gross Availability of Products from Indigenous Natural Crude Oil c/		97	126	170	211
Gross Availability of Products from Indigenous Synthetic & Shale oil c/		40	54	98	100
Sub-total, Asiatic Satellites		137	180	268	311
Gross Availability of all Petroleum Products in the Satellites		7625	9702	10747	11222

a/ Cf. II-D, Refinery Production of Petroleum in the European Satellites.
b/ Cf. II-E, Production of Synthetic Liquid Fuels in the European Satellites.
c/ Cf. III-A, Petroleum in the Asiatic Satellites.
d/ Fiscal 1953 estimates derived by combining estimates for 1st ½ 1953 with ½ of 1952 estimates.

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